county, Ala., and of St. Stephens on the Tombeckbee, contains Nummulites crustaloides and Pecten Poulsoni, (Morton,) two fossils which abound in the Vicksburg deposits, and this limestone is therefore probably of the same age as the tertiary beds of Vicksburg. This formation marks a distinct era in the American tertiary system, intermediate to the Eocene and Miocene formations, but more nearly allied to the former, and perhaps it will be proper to class it as a subdivision of the Eocene. The following table will explain these subdivisions.

Miocene,	Maryland, Virginia, &c.	About 50 recent species.
Upper or newer Eocene,	Natchez, Vicksburg, &c.	103 extinct species; no recent species; and all distinct from those of the lower division.
Lower or older Eocene,	Piscataway, and Fort Washington, Maryland, Claiborne, Alabama, &c.	200 extinct species.

The following genera of shells occur at Vicksburg.

Univalves.	No. of species.	*Univalves.*	No. of species.	*Bivalves.*	No. of species.	*Bivalves.*	No of species.
Actæon,	1	Oliva,	2	Astarte,	1	Mytilus,	1
Buccinum,	2	Pyrula,	2	Amphidesma,	1	Nucula,	3
Bulla,	1	Purpura,	1	Avicula,	1	Ostrea,	1
Cypræa,	2	Pleurotoma,	7	Arca,	1	Panopea,	1
Cancellaria,	1	Rostellaria,	1	Cardium,	4	Pecten,	1
Carsis,	6	Solarium,	2	Chama,	1	Pectunculus,	1
Dentalium,	1	Scalaria,	1	Crassatella,	1	Pinna,	1
Fusus,	2	Sigaretus,	2	Cytherea,	4	Sanguinolaria,	1
New Genus,	1	Turbinella,	2	Corbula,	3	Tellina,	3
Mitra,	6	Triton,	3	Capsa,	2	Venus,	2
Murex,	1	Terebra,	1	Lucina,	1	*Multivalves.*	
Natica,	3	Typhis,	1	Loripes,	1	Pholas,	1
Nummulites,	1	Turritella,	2	Lima,	1	Balanus,	1

A few of these fossil shells have a striking resemblance to species from Dax, Grignon and Bordeaux, and I believe that the Vicksburg tertiary will prove to have been deposited in an era more nearly allied in age to that of the localities mentioned above, than to the Eocene of Paris or London.

III. Zoology.

1. *On the Zeuglodon Remains of Alabama;* by S. B. Buckley. (Communicated.)—Since it has been conclusively proved that the bones of the Zeuglodon, which Mr. Koch exhibited in New York and elsewhere, under the name of Hydrarchos, belonged to different individuals, some may be disposed to doubt that the skeleton of the Zeuglodon, which I obtained in Alabama, now in possession of Prof. Emmons, at Albany, N. Y., is of one individual animal. On this point I would make the following statements.

Through the assistance of Judge Creagh, of Clark Co., Alabama, at a locality nearly three miles from his house, (I think southeast) I obtained a vertebral column fifty feet in length, commencing near the tail and extending towards the head. Judge Creagh had commenced digging at the same place about three years before and found some twenty or twenty-five feet in length of the vertebral column. These vertebræ at the locality extended in a line in their natural order, but owing to their exposed situation the processes were mostly broken off. After considerable search we struck the remaining portion of the vertebræ, at a depth of about two feet, and traced them to a depth of six feet, extending into a side hill. Up to this point the vertebræ lay in close connection, joining end to end, but here their connection was broken off, and owing to the difficulty of digging we ceased work, despairing of obtaining the remainder, which could probably have been secured at the expense of much time and labor. The tail of this individual lay imbedded in a rich bottom composed of black vegetable mould, and its head, without doubt, lay beneath the adjoining hill. The black soil was about eighteen inches deep; beneath this was a yellowish white marl to the depth of six feet, below which was a hard green sand marl in which the last bones we obtained at this locality were imbedded. These bones were numbered, and left in Judge Creagh's door-yard at his request, for the state collection of Alabama; as to their fate since, I have not been informed.

After a few months I returned to Judge Creagh's in 1842, who informed me that a few years before, he had got a few bones to send to Harlan, at Philadelphia, at a locality about three miles distant, and not far from the place where we obtained those already mentioned. We went there chiefly to obtain a head or parts of one; and at a depth of from one to three feet, we dug out a vertebral column commencing near the lumbar region and extending towards the head, measuring twenty six feet in length. The vertebræ were often displaced, sometimes one, two and three feet intervening between them, among which were scattered ribs which were *in situ*, and were generally broken in the middle, the two opposite ends approaching each other. By carefully removing the earth from the upper surface of several of these, we found their length from measurement taken on the spot, to be from four to six feet. At the time we were digging, the ground was very wet from recent rains, and the ribs were so brittle that we succeeded in getting only a few fragments, not more than two or three of which are now with the skeleton at Albany. The vertebræ at this locality were large and in an excellent state of preservation, better than those I found at any other locality, and I now regret that I did not bring any of them away, since they were all left on the ground. While I was engaged here

with one of Judge C.'s negroes, a servant came with the following letter from Judge C., the original of which is now in my possession.

"*Dear Sir*—Most fortunately and apropos, this morning a negro fellow discovered twenty-five feet of a Basilosaurus, with the head, &c., in a line exposed upon the surface of the earth. From appearances, the balance can easily be obtained. I send a boy with a horse for you, supposing it best for you to return to the bones and commence operations here. The place is about half a mile from the house.

Yours respectfully, J. G. CREAGH."

On the receipt of this I repaired to the spot, where I saw for the first time parts of a head and teeth of the Zeuglodon. The Judge had not suffered any of the vertebræ to be disturbed, merely having caused a thin layer of earth to be removed, so as to expose twenty five feet of the animal. A negro that morning had discovered them with his plough, while ploughing, lying in a gentle slope of land, whose surface had been much carried away by the late rains. The field had been in cultivation during many years. Here we obtained the skeleton, which is now at Albany, of which I gave a short account in this Journal in the spring of 1843, and I now repeat what I then published, that it evidently and undoubtedly belonged to one individual animal; excepting the vertebræ of the neck, which were partly displaced, (but lay on a surface less than a rod square, and those that were displaced lay near the head or rather its fragments,) the vertebræ were in an almost unbroken series to the extreme tail—most of them were connected and sometimes two or three would stick together when pryed out of their bed, their ends generally joined; nor do I think there was more than once a vacancy of six inches. The vertebræ increased in size from the neck downward, attaining their maximum size in the lumbar region, at which point our skeleton attained a length of sixty feet or more, and we were much disappointed when it tapered off soon to the tail, at a length of nearly seventy feet. The general outline of the skeleton greatly resembles that of the Plesiosaurus, and this lead Judge Creagh and myself at the time in our discussions with regard to the nature of the animal, to say that Owen must be wrong in referring it to the Cetacea.

These bones constitute by far the most perfect skeleton of the Zeuglodon known, and they are now in possession of Prof. Emmons, at Albany, N. Y. The vertebræ are numbered in the order in which they were obtained.* The boxes in which the bones were brought from

* Our skeleton has the anterior terminal portions of both jaws, with teeth, base of lower jaw, a perfect femur, a portion of a scapula, with the heads of the humerus, an entire humerus, a distinct portion of a fore arm, radius and ulna, a portion of a pelvis, with many fragments of ribs from one to three feet long, besides the vertebræ already named.

Alabama contained a few portions belonging to other individuals, among which are one or two vertebræ which were not numbered, and which were never intended to be palmed off as belonging to the skeleton. Also a few fragments of ribs already mentioned, and the tibia (?) figured by Prof. Emmons, and described in the American Quarterly Journal of Agriculture and Science, vol. iii, p. 227. This specimen belongs to the first individual described in this note. However, no one would suppose but that it belonged to the skeleton at Albany, since the vertebral columns of the two individuals were nearly of the same size. The base of the lower jaw, plate 1, fig. 1., described by Dr. Emmons, p. 228 of the same volume, was obtained near the summit of the hard grey limestone bluff, about a mile from Suggsville, Clark Co., and about twenty-five miles distant from the Creagh plantation. This bone was imbedded upon the upper surface of the rock, and the outer surface of the bone was exposed and showed the yoked teeth with their large serratures in great perfection. It was upwards of three feet long. Owing to the hardness of the rock and brittleness of the bone, the specimen was often broken before detaching it with a large portion of rock, at the close of a toilsome day's work. I obtained this specimen through the kindness of Dr. Denny, of Suggsville, who informed me of its existence. It is proper to add that the skeleton at Albany has its own portions of the lower jaw, so that Prof. Emmons knew that it belonged to a different individual, and has merely described it as an interesting bone of the collection.

I should have stated that before going to Suggsville I visited another locality about a mile from Clarksville, on the road towards Macon, in Clark Co. This skeleton was in a sandy loam, and the bones were in a bad state of preservation, doubtless caused by the predominance of sand and deficiency of lime in the soil. I only staid there part of a day, having met with several thin plates of bone belonging to the jaws, several cervical vertebræ and fragments of ribs. The vertebræ and ribs were larger than those of the skeleton at Albany, and were all left on the spot excepting two fragments of ribs eight or ten inches long, which are with the skeleton at Albany. My object in visiting this locality was to obtain something approximating to a perfect head, and as soon as I saw it could not be done, the locality was abandoned. I believe that a larger vertebral column than any yet obtained is still there. I saw a single vertebra of the zeuglodon, in possession of Mr. Cooper, a lawyer at Claiborne, which was eighteen inches long, and twelve inches in diameter at the ends.

From what I have written it will be seen that the bones which I have enumerated as not belonging to the individual skeleton in Albany, add not to its size, nor were they ever intended by me to be considered as

part of that skeleton; but only more fully to illustrate the nature of the remarkable animal to which they belonged. I will add, that Judge Creagh informed me that the bones which he sent to Harlan, were found in different and distant places on his plantation, but described by Harlan as from one locality and belonging to one individual. The fragments of a jaw-bone, containing teeth much broken, were found about three-fourths of a mile from the house. This was the specimen which Harlan took to London, and from which Owen named the animal.

Judge Creagh was among the first settlers of Alabama, and he often told me of the large number of bones which were on his and the adjoining plantations, when he first moved there, how they interfered with the tillage of the soil, and how vast numbers of them had been burned and otherwise destroyed; and he added that an old hunter who lived among the Indians prior to the settlement of that country by the whites, had often told him that he had seen several entire skeletons of this animal, lying upon the surface of the ground, upwards of a hundred feet in length.

Zeuglodon Cetoides.—In addition to the foregoing remarks of Mr. Buckley, we take this opportunity of presenting an outline sketch of the head and one of the teeth of this animal, which were drawn for us by Mr. Russell Smith of Philadelphia, from the skeleton which has been fancifully called the *Hydrarchos*, by Koch. The head, as measured by Dr. Wyman,* is five feet seven inches long. "That part purporting

Fig. 1.

to be the cranium proper, and which serves more especially to protect the brain, consists apparently of a single bone and is destitute of any visible sutures, is a little more than one foot long, about five inches wide, and has, attached laterally by cement, two bones forming incomplete zygomatic arches. Inferiorly it is so much covered with cement, that little or nothing can be seen of its surface. Posteriorly there are no condyles, nor any foramen for the passage of the spinal marrow; in fact no foramina are any where visible. These characters lead to the

* Proceedings of the Boston Soc. of Nat. Hist., Nov. 1845, p. 65.

supposition that it is not the true cranium, but that it may be some bone or fragment not in its natural position. The size of the supposed cranium is obviously too small for lodging the brain of an animal 114 feet long, inasmuch as its cavity, if it had one, can exceed but little that of the spinal canal, which is visible in some of the vertebræ." "The jaw has been crushed by violence," and the fragments, sometimes inverted, are held together by the natural matrix, in which the whole was originally imbedded.

Two of the cochleæ of the ear of the Zeuglodon, were detected by Prof. H. D. Rogers,* among the loose bones of Koch's collection. They are about the size of a small lemon, and display that variety of the whorled or convoluted form of the cochlea, peculiar to the Cetacea.

The teeth of this animal vary much in size and form, as may be seen by comparing the annexed figure with those lately published by Dr. Emmons,† from the skeleton brought to Albany by Mr. Buckley, and also with those published by Dr. R. W. Gibbes‡ of South Carolina, under the name of *Dorudon serratus*. The figure here given shows very perfectly the *yoked* form of the teeth, from which Prof. Owen has derived the name Zeuglodon. It is one third less than the natural size. No perfect series of the teeth of this animal has yet been seen by a good anatomist, "and we are therefore ignorant what are the varieties of form which such a series would present,

Fig. 2.

Two-thirds natural size, lineally.

* Proceedings of the Boston Soc. of Nat. Hist., Nov, 1845, p. 79.

† Am. Quarterly Journal of Agriculture and Science, vol. iii, p. 228.

‡ Proceedings of the Acad. of Nat. Sci. of Philadelphia, June 1845, p. 254.

in different parts of the same jaw." It is interesting to know that the geographical range of this animal has been carried so far east as the Santee canal in South Carolina, from whence the teeth and portions of the jaw, figured by Prof. Gibbes, were taken, being imbeded in the green sand marl.

With regard to the skeleton exhibited by Mr. Koch as the Hydrarchos, Dr. Wyman concludes, 1st, that these remains have never belonged to one and the same individual; 2d, that the anatomical character of the teeth indicates that they are not those of a reptile, but of a warm-blooded mammal. It is worth mentioning, as an instance of the accuracy and skill of the joiner of the Hydrarchos, that the extremities of the so called paddles of this skeleton, were formed of "*casts of a camerated shell, a species of nautilus*"! of which, specimens, brought from the state of Alabama, and now in the cabinet of the Academy of Natural Sciences, were shown to Prof. Wyman, by Dr. Morton of Philadelphia.*

2. *Mastodon Giganteus.*—The publication of Prof. Owen's "British Fossil Mammalia and Birds," has supplied us with the means of presenting our readers with a most perfect and elaborate portrait of the fine specimen of this animal, which is now standing in the British Museum. Mr. Owen says, (p. 298,) "The almost complete skeleton of the *Mastodon giganteus*, so well known to the public as the "*Missouri Leviathan*," when exhibited, with a most grotesquely distorted and exaggerated collection of the bones in 1842 and 1843 in the Egyptian Hall, Piccadilly, but now mounted in strict accordance with its natural proportions, in the British Museum, has enabled me to present, in the subjoined cut, (see next page,) as perfect a representation of the mastodon, as that of the mammoth given at the head of the preceding section."†

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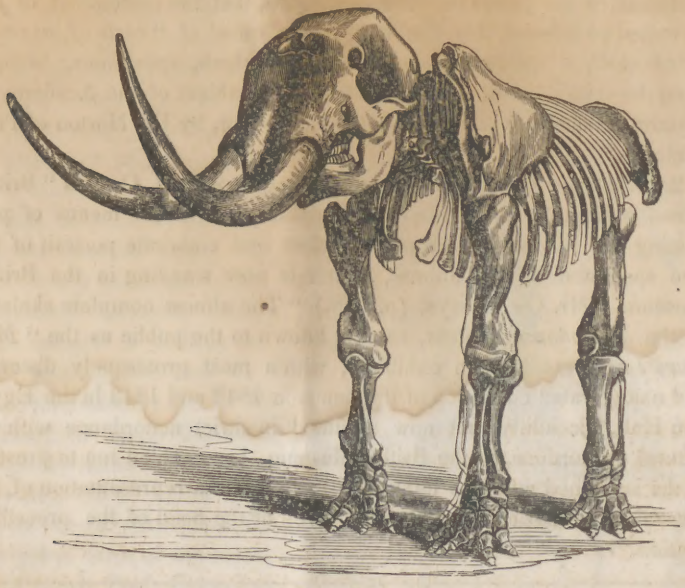
* Having received more than one application from respectable persons, unacquainted with comparative anatomy, to express an opinion as to the character of Koch's Hydrarchos, we will only say, that if the foregoing remarks, the testimony of one of the best comparative anatomists in America; the evidence of Mr. Lyell and Mr. Houston, (vol. i, p. 313) and of Dr. Lister; (Proceedings Bost. Soc. Nat. Hist. Feb. 26, p. 94) are not sufficient to convince the most credulous of the fictitious character of this skeleton, perhaps their faith in the skill of the joiner may be enlightened by a perusal of the following note on the mastodon. It is certainly not impossible that a Zeuglodon may be found 114 feet long; but if constructed by the same inventor, we might as well expect to see it 300 feet in length.

† Those who saw the "grotesquely distorted" monster, which was shown by Mr. Koch in this country, as the Missourium or Leviathan, will hardly recognize in the beautiful drawing on the next page, the same animal as restored by the accurate hand of Owen. The large lithographic print of the animal as mounted by Koch, which this person had executed at Dresden, will serve to convey to

In spite of much quackery and pretence, not only on the part of the notorious "author of the two largest known animals," (i. e. the "Missourium" here figured, and the *Hydrarchos*,) but also, from those, whose position and opportunities should have produced better things,* we have at length settled quietly down upon the true and well ascertained characters of the great American mastodon. Dr. J. B. S. Jackson has given us a lucid statement of the principal osteological characters of the mastodon.† His observations were made on the skeleton found at Schooley's Mountain in New Jersey in 1844, which was however deficient in the sternum, a few caudal vertebræ and the feet.



He determined from this skeleton, that the animal had twenty dorsal vertebræ, whereas Cuvier and Owen make but nineteen; this observation is confirmed by the skeleton found at Newburgh‡ last summer, (1845,)

those who did not see this "anatomical fiction," a good idea of its awful proportions. It will be remembered as one characteristic of the genus "*Missourium*," that the tusks were placed at ninety degrees from their true position, pointing *outward* and backward. The trustees of the British Museum paid the owner, £1000 sterling (not "£2000") for this skeleton, and £300 additional for some accompanying bones. This we know from the very best authority.

* Proceedings of the Geol. Soc., June 15, 1842.

† Proceedings of the Boston Soc. Nat. Hist., Oct. 1, 1845, p. 60.

‡ American Journal of Science, Second Series, i, 269. See also a letter of Dr. Warren's to Mr. Owen, published in the Ann. Mag. of Nat. Hist., for March, 1846, No. iii, p. 145, in which he says the vertebral column has "7 cervical vertebræ, 20 dorsal, 3 lumbar, and the os sacrum." The ribs, 20 in number, are perfect.

and now in the possession of Dr. Warren.* Cuvier had suggested that one vertebral bone might be wanting, (*Ossemens Fossiles*,) and then that the number would be the same as in the elephant. The dentition of the animal has been satisfactorily made out by Mr. Owen, who finds *seven* teeth belonging to the series of the lower jaw, counting from the youngest.

It may seem unnecessary to state that the genus *Tetracaulodon* of Godman†, was clearly shown by Mr. Owen,‡ in 1842, to be only the immature state of both sexes of the *Mastodon giganteus* of Cuvier, and that in the male, one, at least, and usually the right, of the two lower tusks was retained, but that in the female both were lost as she approached maturity.

IV. Botany.

1. *Vegetable Physiology.*—M. Dutrochet in connection with M. Becquerel has shown that when a Chara is subjected to the action of an electric current, the peculiar circulation of this plant ceases for a while, and is recontinued after a certain period, if the current is unchanged; it is discontinued in the same manner with each change in the intensity of the current, whether the intensity is increased or diminished.

Variations of the temperature produce nearly the same effect, and it is also apparent on transferring the plant from fresh to salt water, and the reverse.

Electro-magnetism causes no effect. The circulation is not at all influenced by an electro-magnet capable of supporting near 2000 kilogrammes, whether at the establishment or breaking of the current, the reversing of the poles, or any other mode of operation.

M. Dutrochet concludes from these facts that the circulation in the Chara depends on a peculiar *vital force*, and not at all on electricity or magnetism, as the first of these, acts like all other exciting forces, and the second not at all.

2. *Distribution of the Vestiges of Palms in the Geological formations.*—Prof. Unger, in the work here cited, states, 1st, that no vestiges of palms have been detected in the earliest rocks which contain the organic remains of maritime and terrestrial plants. 2d. That palms bore some small part in the vegetation at the period of the coal formation, in which Ferns, Lycopodiaceæ, Lepidodendreæ, Calamiteæ, Cycadaceæ, and Coniferæ appear to have formed the principal growth. He names the following forms, viz. :—

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* See also the Am. Quarterly Journal of Agriculture and Science, vol. ii, p. 203.

† Transactions of the Am. Phil. Soc., New Series, iii, 478.

‡ Proceedings of the Geol. Soc., 1842.